The Department Of Energy
Ventilation and Indoor Air Quality Program

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History of Accomplishments

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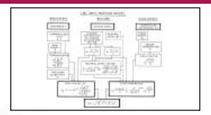
- Developed and tested the LBNL Infiltration model, now used commonly by industry
- Incorporated model in the ASHRAE Handbook



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- Developed protocols for measuring leakage in building envelopes and duct systems with fan-pressurization devices such as Blower Doors
- Widely used in energy audit and retrofit programs

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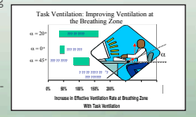
- Laboratory and field studies and economic modeling of Heat Recovery Ventilators helped industry to make technology improvements
- Evaluating and developing task ventilation air supply technologies
- Reviews and modeling of demand controlled ventilation and displacement ventilation



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- Developed the COMIS and CONTAM multizone airflow and pollutant transport models
- Provided a tool for building design
- Integrated into the widely used TRNSYS building energy simulation program, integration into the Energy+ program is underway
- Provided a tool now being used to determine how to reduce the vulnerability of buildings to chemical and biological attacks by terrorists

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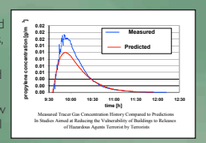
- Developed and evaluated tracer gas methods used to measure ventilation rates, ventilation efficiencies, and pollutant dispersion rates in buildings
- Provided a tool for diagnosis of indoor airflow and indoor air quality problems
- Provided a tool now being used to determine how to reduce the vulnerability of buildings to chemical and biological attacks by terrorists



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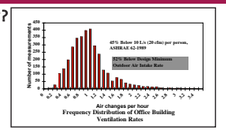
- Measured and modeled infiltration and ventilation rates in houses and commercial buildings
- Determined how actual ventilation rates compare to the rates in standards
- Demonstrated that "sealed" commercial buildings have substantial infiltration
- Documented that newer homes have much lower infiltration rates
- Quantified energy impacts of infiltration and ventilation in residential and commercial buildings



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- Analysis of potential of natural ventilation in U.S. office buildings
- Simulations of natural and hybrid ventilation system performance in U.S. office buildings
- Development of design and analysis tools for natural and hybrid ventilation systems

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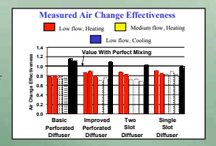
- Performed laboratory experiments to determine how system design and operation affects ventilation efficiency
- Devised the commonly used metric—air change effectiveness
- Demonstrated in field studies that short circuiting of air between supply and return locations is usually not a serious problem in US buildings
- Demonstrated that partitions don't usually lead to stagnant zones
- Led ASHRAE development of a standard ventilation efficiency measurement method



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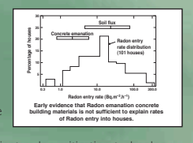
- Performed laboratory and field studies and modeling of radon entry and mitigation
- Determined that pressure driven soil gas entry, not radon emanation from concrete, was almost always the dominant radon entry process where concentrations are elevated
- Basis for sub-slab ventilation an effective and energy efficient radon mitigation technology



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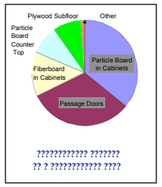
- Pioneered the chamber-based methods now used by the private sector to quantify VOC emission rates
- Identified many important VOC sources
- Demonstrated that increased ventilation is relatively ineffective for some VOCs
- Determining which VOCs are most important to health or for odor complaints
- Working with builders of homes and classrooms industry to evaluate and demonstrate VOC source control measures



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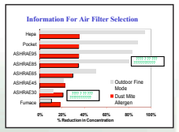
- Quantified opportunity to decrease indoor particle concentrations for various types of particles
- Determined that more efficient filters do not always cost more
- Providing guidance for filter selection



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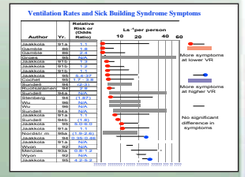
- Performed first major U.S, epidemiologic study—the California Healthy Building Study
- Identified several risk factors for symptoms including lower ventilation rates, higher carbon dioxide concentrations, air conditioning, higher air temperature, selected mixtures of volatile organic compounds
- Enabled more effective prevention and remediation of SBS problems



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- Documented opportunity for large health and productivity gains using practical measures
- Helping to change attitudes about the importance of indoor environmental quality

Support to Professional Organizations

DOE supported researchers participate extensively in ASHRAE and other professional organizations. Activities include:

- Support for the development of many consensus standards addressing building ventilation and IAQ
- Service on technical committees of professional organizations
- Writing handbook chapters and position papers
- Service on National Academy of Science Panels that perform critical reviews of the state of knowledge on various topics

Building America Program

DOE provides technical support to innovative home builders to spur the development of home designs and construction practices that improve energy efficiency and maintain or improve indoor air quality.

Spin Offs From DOE'S Ventilation and IAQ Research Program

Energy Efficient Ducts

- Identified energy losses from ducts as a major issue
- Developed methods to characterize losses
- Devised aerosol based sealing method, which is now commercialized

Energy Efficient Fume Hoods

- Developed patented design for a laboratory fume hood with a 50% decrease air flow
- Protects worker while saving energy

DOE's Current Ventilation and IAQ Eesearch Areas

- Residential infiltration and ventilation
- Infiltration heat recovery
- Ventilation technologies for commercial buildings such as task ventilation and natural or hybrid ventilation
- Controlling VOCs in manufactured housing
- Energy efficient air cleaning
- Healthy Buildings
- IEQ and Productivity

For More Information

- DOE Programs: http://www.energy.gov/efficiency/index.html
- Ventilation and IAQ Research at Lawrence Berkeley National Laboratory, including online bibliography:http://eetd.lbl.gov/ied/ied.html
- Bibliography of Ventilation and IAQ Publications by the National Institute for Standards and Technology: http://fire.nist.gov/bfrlpubs/bfrlall/key/key1488.html
- Indoor Health and Productivity Project, including online bibliography: www.ihpcentral.org